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NTN for Mission Critical Communications

Executive overview

Envisioning communication without limits, even in the most challenging situations. Non-terrestrial networks (NTN) are poised to revolutionize mission-critical networks (MCN), offering reliable, resilient, and ubiquitous connectivity that complements ground-based networks. What are the key challenges that this technology must overcome to become suitable for mission-critical users?

Content

Introduction

Non-terrestrial networks (NTN) play a crucial role in MCN by providing reliable, resilient, and ubiquitous connectivity that complements traditional ground-based networks.

Today, mission-critical systems use NTN to provide backhaul for wide area networks and/or deployable network assets. As NTN evolves, direct-to-device solutions will extend coverage to these users. This synergy between terrestrial and non-terrestrial networks ensures extensive coverage, enabling uninterrupted communication during emergencies, thus bolstering the effectiveness of mission-critical operations worldwide.

Different satellite systems have been used for many years to provide services such as TV broadcasting, navigation, communications, surveillance, and weather forecasting. These satellites orbit Earth in three primary configurations: geostationary (GEO), medium earth orbit (MEO), and low earth orbit (LEO).

GEO satellites, positioned at an altitude of approximately 36,000 km, offer a wide field of view, making them ideal for satellite television broadcasting, business-to-business data services, and government communications. However, their significant distance results in high latency and limited data rates. MEO satellites, typically orbiting at altitudes ranging from 8,000 km to 20,000 km, are primarily used for navigation systems like Galileo, GPS, and GLONASS. Some MEO constellations also provide communication services, offering lower latency and higher data rates compared to GEO satellites.

LEO satellites, operating at altitudes ranging from 400 to 2,000 km, provide the lowest latency and highest data rates compared to other satellites. Their smaller footprint necessitates larger constellations for global coverage. These satellites are well-suited for mobile broadband (MBB) and Internet of Things (IoT) applications.

3GPP has been actively working to integrate satellite communication into 5G NR, NB-IoT, and LTE-M standards.

Integrating NTN into 3GPP technology allows chipset and device vendors to target mass-market solutions by ensuring standardization across terrestrial and non-terrestrial networks. This promotes economies of scale, lowering costs and accelerating development, while enabling widespread adoption of NTN-compliant devices across diverse markets.

Two main architectural approaches are being considered for 3GPP NTN

1. Transparent architecture

- The satellite acts as a simple repeater.
- Minimal processing is performed on the satellite, limited to RF functions.
- A terrestrial gNodeB handles most of the processing.

2. Regenerative architecture

- The satellite carries a full or partial gNodeB, enabling packet decoding and processing.
- More flexible and offers better performance.
- Supports inter-satellite links for enhanced global coverage.

Integrating satellite communications into 3GPP standards ensures seamless global connectivity and paves the way for innovative applications.

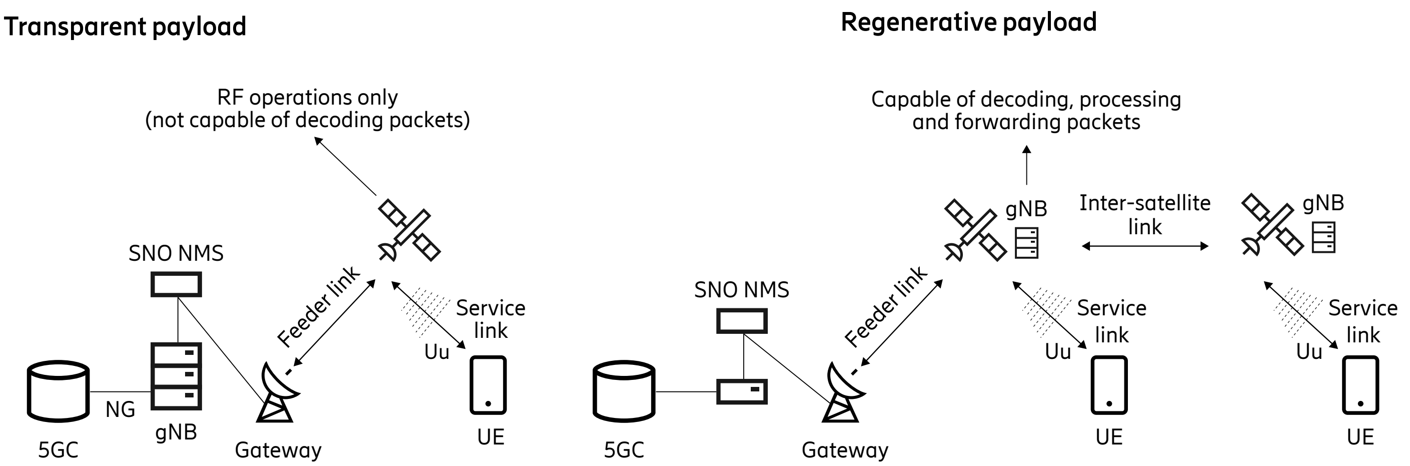

Figure 1: Different NTN architectures

For further information regarding NTN, please refer to "[Using 3GPP Technology for satellite communications](#)" (Ericsson Technology Review) on the Ericsson web portal.

Mission-critical networks (MCN) definition

MCN systems are essential for the operation and safety of critical services, where any failure or delay can lead to serious and potentially catastrophic consequences. These communications are integral to sectors like defense, emergency services (police, fire, and ambulance), utilities, railways, and digital airspace.

Many government authorities are modernizing their existing mobile communication networks, much of which are based on legacy narrowband technologies.

The mission-critical market is witnessing a widespread adoption of open 3GPP standards and rich, multivendor ecosystems. It facilitates the interoperability of communications, enhances cross-agency collaboration and unlocks important intelligence through secure and reliable networks.

Non-terrestrial networks (NTNs) play a pivotal role in MCN across sectors like public protection and disaster relief (PPDR), critical infrastructure, defense, and government agencies. As data-driven operations expand, NTNs offer resilient, scalable, and reliable connectivity by complementing terrestrial networks. They ensure seamless communication in remote, underserved, or disaster-affected areas, enhancing operational efficiency and supporting modern communication infrastructures.

Key benefits of 3GPP-based NTNs for mission-critical users

- **Extending coverage:** NTNs expand network coverage where traditional infrastructure is unavailable or compromised, ensuring secure and uninterrupted communication for emergency responders, military personnel, and public safety officials in challenging environments.
- **Facilitating ubiquitous connectivity:** NTNs play a critical role in achieving ubiquitous connectivity by ensuring seamless transitions between terrestrial and non-terrestrial networks. This capability is essential in scenarios where reliable communication is paramount, such as during disaster relief operations or national emergencies.
- **Unified access and seamless service continuity:** 3GPP 5G NTNs empower the development of unified devices capable of operating seamlessly across terrestrial and non-terrestrial networks, eliminating the need for separate hardware systems. These devices, coupled with unified subscription plans, allow users to access both network types under a single service agreement, reducing complexity and operational overhead. Additionally, NTNs ensure uninterrupted service continuity even when agencies belong to different mobile network operators (MNOs).
- **Critical interoperability for mission-critical situations:** Interoperability is at the heart of NTNs' functionality, allowing various agencies to communicate and collaborate effortlessly across network and organizational boundaries. This capability is crucial for coordinated efforts in mission-critical situations, such as disaster response, where every second counts and seamless communication can determine success or failure.

Market update

The global NTN market is experiencing significant growth, driven by advancements in satellite technology and the rising demand for ubiquitous connectivity. Various market analyses indicate that the 5G NTN market is projected to be between USD 20 and 30 billion by 2030, reflecting a compound annual growth rate (CAGR) of 20.4 percent The government, defense, and public safety sectors are expected to account for a substantial portion, with estimates indicating they will make up over 35 percent of the total market by 2030.

This growth is further supported by government initiatives in collaboration with satellite operators to modernize communication infrastructures, as detailed in Table 1 below*.

Satellite operator	Government engagements	Date of the announcement	Use cases/Technology	External reference
Lynk Global	Lynk announced a contract with the U.S. Department of Defense (DoD) and Department of Homeland Security (DHS) for Sat2Phone services.	April 2024	Satellite-to-phone connectivity for standard mobile devices, enhancing communication in remote areas and during emergencies.	Lynk announces Sat2Phone contract with the U.S. government
Eutelsat	Collaboration with OneWeb Technologies to offer services to the U.S. government.	September 2024	Integrated low earth orbit (LEO) and geostationary earth orbit (GEO) satellite communication solutions.	Eutelsat America Corp. and OneWeb Technologies Inc announce leadership team
SES	Partnerships with LEO operators like Starlink and OneWeb to provide integrated services for the government.	March 2024	Multi-orbit satellite networks offering seamless connectivity solutions.	Satellite firms forge unlikely alliances to create seamless multi-orbit networks
Project Kuiper (Amazon)	In talk with Taiwan's government to enhance satellite communication infrastructure.	December 2024	LEO satellite constellation aimed at providing global broadband connectivity.	Taiwan in talks with Amazon's Kuiper on satellite communications amid China fears
SpaceRISE Consortium (Hispasat, SES, Eutelsat, and others)	Part of the SpaceRISE consortium that signed a contract with the European Commission and the European Space Agency to launch IRIS.	December 2024	Responsible for designing, delivering, and operating the governmental ground segment of IRIS² for secure telecommunications services to EU member states; leading the development and operation of the layer.	SpaceRISE consortium signs agreement with the European Commission and the European Space Agency to launch IRIS
Starlink/Starshield	1. Partnering with a national space force for a classified satellite communications program. 2. Engaging with European government to secure a multi-billion-dollar deal for military-grade satellite services.	1. September 2023 2. March 2025	1. Advanced encrypted satellites with anti-jam capabilities for defense applications. 2. Secure military communications.	1. Space.Com

Table 1: Government initiatives

*Not an exhaustive list of activities. Focus on government driven initiatives. Not necessarily fulfilling mission-critical grade needs and requirements at the initial stage.

For more information regarding Ericsson MCN refer to: Ericsson mission-critical networks.

Requirements and challenges for NTN mission-critical networks

In addition to offering numerous opportunities, 3GPP 5G NTNs introduce unique requirements and challenges in meeting the strict demands of mission-critical users.

The text below explores the key technical and operational challenges that 5G NTN faces in addressing the mission-critical needs, as well as the essential requirements to ensure reliable and secure communications in these environments.

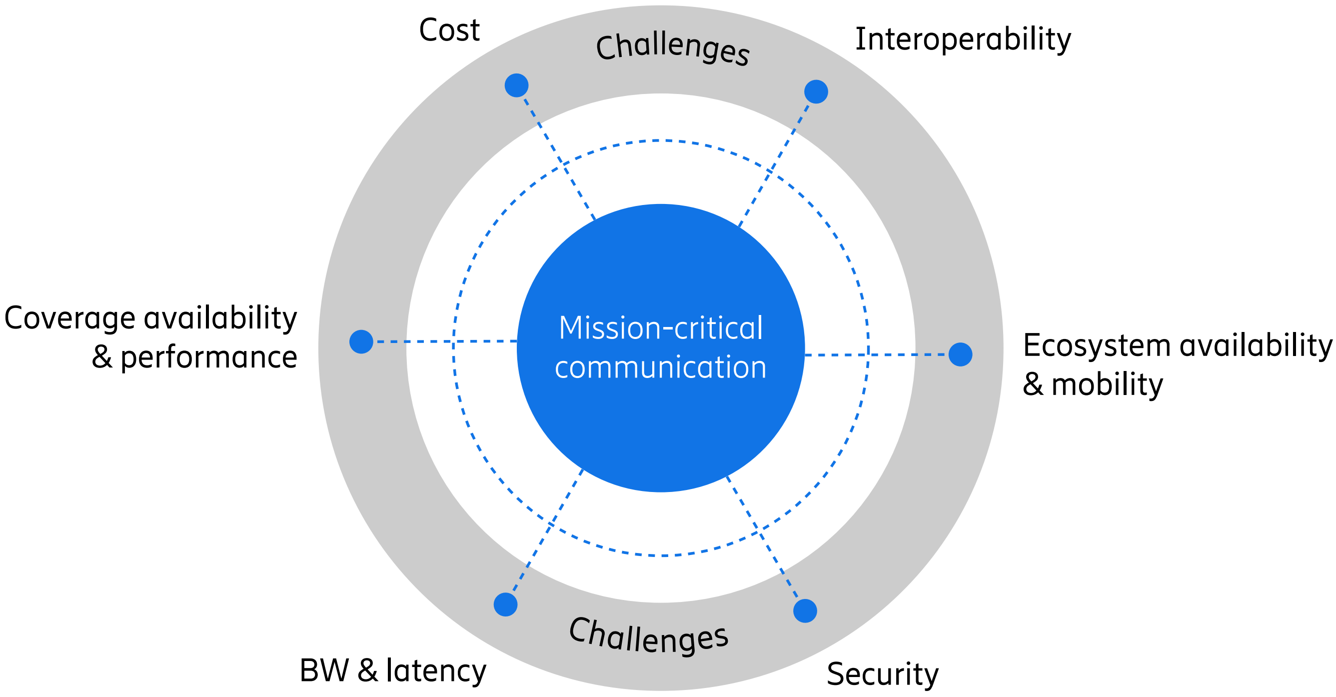

Figure 2: Challenges faced by NTNs

Coverage availability and performance

Coverage is influenced by several factors, including the number and position of satellites in orbit, the accuracy of antenna pointing, the frequency bands used, and physical obstacles like tall buildings or geographic features such as valleys. Effective communication networks must be designed to ensure wide and consistent coverage, even in areas with potential signal obstructions. Uninterrupted and stable coverage across all areas of operation is essential for effective MCN.

These networks can still face challenges such as congestion-related slowdowns, which can impact their reliability and effectiveness, as well as restricted indoor coverage, which is yet to be analyzed.

To enhance connectivity in indoor environments, complementary technologies, such as hybrid terrestrial-satellite solutions or repeaters might be required. Coverage constraints, especially in the uplink direction, are influenced by factors such as high path loss, limited transmit power at satellites and user equipment, and the poor antenna gain of handheld devices. Additionally, NTN capacity and throughput are inherently lower than terrestrial networks due to large cell sizes, restricted transmission power, and the need for robust signaling to maintain connectivity over vast distances. These limitations can also impact bandwidth-demanding ISR (intelligence, surveillance, and reconnaissance) applications, which rely on high data rates and low latency for effective operation.

Interference risks might also arise when terrestrial and satellite systems share the same spectrum. Regulatory frameworks in many regions restrict the use of communication service providers' (CSPs') terrestrial spectrum for satellite operations, providing a safeguard against interference. Nevertheless, careful spectrum management and coordination remain essential to ensure seamless coexistence.

Security

Transmission of sensitive and potentially classified information is a fundamental aspect of MCN, particularly in public safety, emergency response, and defense operations. Ensuring the security of these communications is paramount to protect against unauthorized access and potential cyber threats. This requires robust encryption and secure transmission protocols to maintain the confidentiality, integrity, and availability of the information being exchanged. Advanced security measures must be integrated into the communication networks to prevent data breaches and ensure that sensitive information always remains protected.

This is a critical concern for mission-critical users, particularly in today´s geopolitically sensitive environments where communication networks may be vulnerable to foreign monitoring and interference. Satellite beams often cover areas beyond national borders, increasing the risk of unintended signal capture by foreign monitoring stations.

The unique architecture of NTNs introduces additional security considerations. Protecting data integrity, preventing unauthorized access, and ensuring end-to-end encryption across satellite links are essential to meet the stringent security needs of mission-critical users.

An illustrative example is the European IRIS2 Satellite Constellation, which emphasizes improved security by utilizing quantum cryptography through the European Quantum Communication Infrastructure (EuroQCI) and enhancing cybersecurity through a secure-by-design approach.

The following diagram illustrates a backhauling scenario where an end-to-end security solution is needed because the satellite connection is deemed "not trusted," therefore management control and user traffic flows should be encrypted. Some satellite providers may offer dedicated links with improved security capabilities:

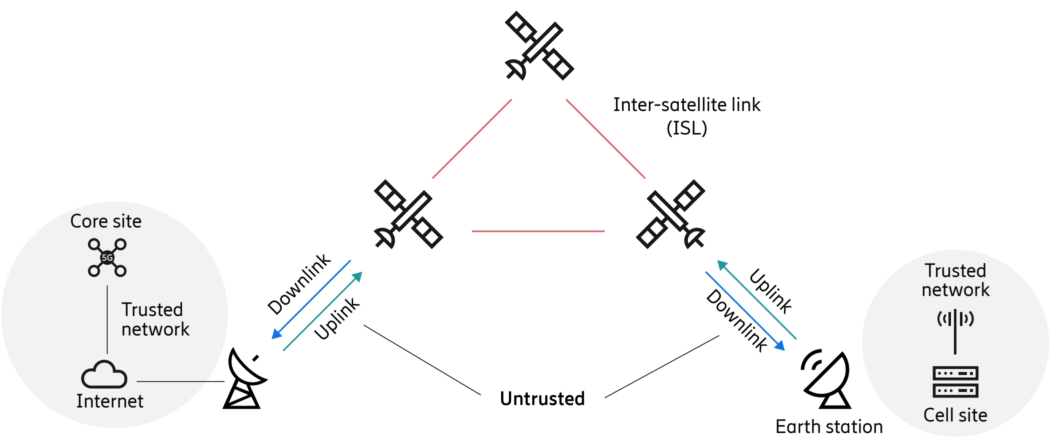

Figure 3: Backhauling scenario

Bandwidth and latency

Beyond basic voice communications, mission-critical scenarios demand advanced capabilities such as live video feeds, data transfer, and real-time coordination, especially for first responders during emergencies or defense operations. The bandwidth must be sufficient to support these data-intensive applications, while latency needs to be minimized to ensure real-time communication. Networks that operate with satellites closer to the earth's surface, like those in LEO can provide lower latency, enhancing the speed and responsiveness of communications. For mission-critical users, this low-latency environment allows for near real-time collaboration, which is crucial in time-sensitive situations.

3GPP SA1 in TS 22.261 specifies performance requirements for satellite access, along with some key services used by mission-critical users. It outlines the performance requirements for satellite access in public safety, vehicular connectivity, and narrowband IoT connectivity scenarios. For public safety, the required data rate in uplink (UL) and downlink (DL) is 3.5 Mbit/s, with handheld user equipment (UE) operating at speeds up to 100 km/h. For vehicular connectivity, the DL requirement is 50 Mbit/s, and the UL requirement is 25 Mbit/s, with a vehicle-mounted UE capable of operating at speeds up to 250 km/h. Lastly, in narrowband IoT connectivity, the expected DL rate is 2 kbit/s, and the UL rate is 10 kbit/s, using IoT devices operating at speeds up to 100 km/h.

Latency is a key factor in NTN, as it directly affects the performance of mission-critical applications that require real-time communication. End-to-end (E2E) latency in NTN is influenced by multiple factors, including propagation delay, transmission delay, processing time, queuing, and other network-related delays. Unlike terrestrial networks, where signals travel shorter distances over fiber or radio links, satellite-based NTN introduces additional delays due to the increased signal travel time.

LEO systems typically offer latencies in the tens of milliseconds, while GEO systems experience latencies of several hundred milliseconds. Satellite systems with service to handheld terminals may achieve spectral efficiencies of around 1 b/s/Hz, positioning them as viable candidates for mission-critical applications. Higher spectral efficiencies (several bits/s/Hz) can be achieved with larger terminals employing high-gain antennas, which however, limits the portability of such terminals. In addition, the performance remains heavily dependent on the capabilities of the satellite antenna.

This increase in latency is crucial for mission-critical applications such as public safety, defense, autonomous operations, and emergency response, where milliseconds can determine outcomes. Delays in command execution, real-time monitoring, or data synchronization can significantly impact operational effectiveness.

Interoperability

Seamless communication across various agencies, departments and segments (air, sea, land) is essential in mission-critical situations to enhance coordination and efficiency.

Interoperability ensures that different systems can work together, allowing federal, state, and local agencies to communicate effectively without technical barriers. This capability is vital to avoid duplication of efforts, reduce response times, and improve overall coordination during emergencies.

Developing and implementing 3GPP communication standards and protocols for NTN is essential for enabling seamless interoperability between terrestrial and non-terrestrial networks.

Ecosystem availability and mobility

The environments in which mission-critical actors operate are often unpredictable and demanding. This requires communication equipment to be highly durable, and capable of withstanding extreme conditions such as temperature fluctuations, moisture, dust, and physical shocks.

The mobility of the equipment is also crucial, as mission-critical users need to carry, deploy, and operate communication devices quickly and efficiently across various terrains and situations. Equipment designed for these purposes must be lightweight, portable, and resilient to ensure reliable performance in all conditions.

The development of a robust ecosystem, including devices, chipsets, and applications optimized for NTN environments, is pivotal. Collaboration across industries is required to ensure the availability and interoperability of NTN-capable devices.

Cost

The financial aspect of implementing and maintaining MCN systems is a significant consideration for emergency response and defense agencies. It involves evaluating the initial capital expenditure and the ongoing operational costs. These costs include not only the equipment but also airtime fees, maintenance, training for users, and technical support. Effective budgeting must account for the total cost of ownership over the equipment's lifecycle to ensure sustainability and continuous operational capability without unexpected financial strain.

Lastly, it is important to highlight mission-critical feature parity. Achieving feature parity between terrestrial and satellite networks is crucial. Mission-critical applications such as push-to-talk, push-to-video, mission-critical data, and QPP (quality of service, priority, and pre-emption) must perform reliably across NTNs without compromising the capabilities available in terrestrial networks.

While the 3GPP has made significant efforts to standardize these features for NTNs, the challenge lies in translating these standards into practical implementations across a diverse range of networks, devices, and products. Effective implementation demands collaboration and planning across industries to ensure interoperability and consistent performance, regardless of the network type or device used. Without this, critical operations such as emergency response or defense communications are at risk of being compromised by inconsistencies or performance gaps.

Relevant satellite use cases for mission-critical networks

The following use cases highlight the versatility and importance of satellite and non-terrestrial networks in providing robust, reliable, and wide-ranging communication solutions for various critical applications, especially in scenarios where traditional terrestrial networks may not be available.

Network backhaul

- **Dedicated broadband network backhaul — As primary or backup**

  This feature refers to the use of satellite broadband as a dedicated backhaul. It can serve either as the primary communication link or as a backup to terrestrial networks. This ensures that critical communication services remain operational even when terrestrial networks are unavailable or disrupted, which is vital during emergencies and natural disasters.

- **Deployable networks for remote/no coverage areas - Backhaul for a deployable system or direct-to-device communications**

  In areas where there is no existing network coverage, satellite broadband can provide a deployable network infrastructure that first responders can use. This includes a dedicated coverage system, which offers wide-area coverage, and direct-to-device communications, which allows direct satellite links to devices on the ground. This capability is essential for establishing communication in remote areas or in the immediate aftermath of a disaster.

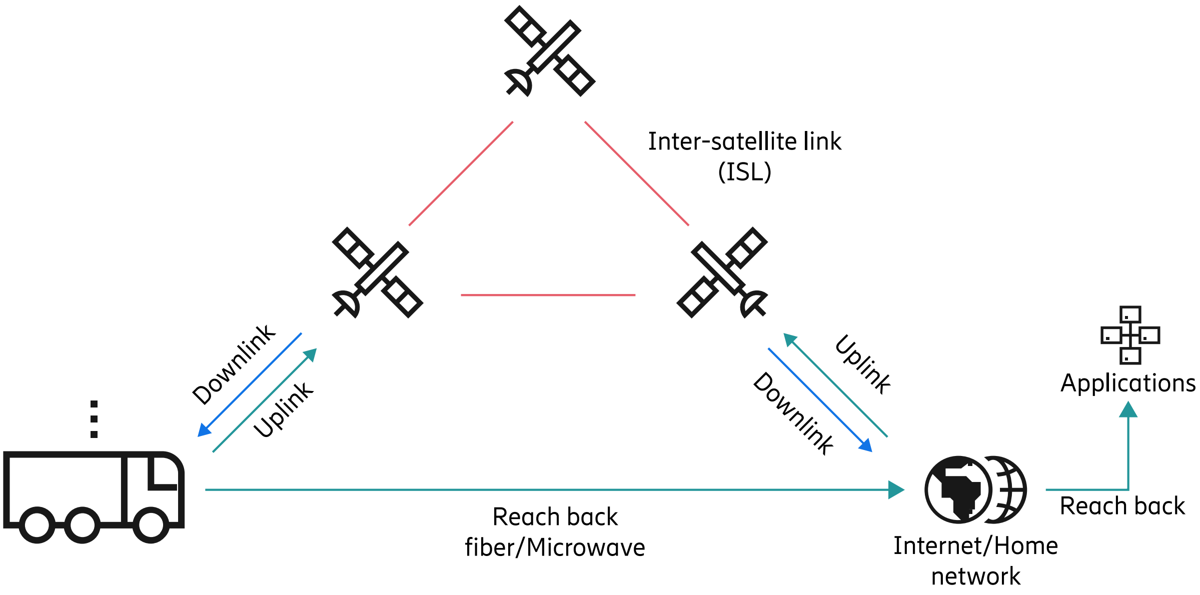

Figure 4: Backhaul deployable scenario

- **Cross-border backhaul links — Primary or backup**

  Satellite broadband can facilitate cross-border interoperability, which is essential for coordinated responses during international emergencies or crises. While it should be noted that satellite operators still need authorization to offer their services per country/region, the global nature of satellite constellations ensures that communication links can remain seamless and uninterrupted across borders, supporting joint efforts by different national agencies and organizations.

- **Drone asset delivery, surveillance, and rescue data (backhaul data)**

  Terrestrial networks (TNs) today are fundamentally designed to serve ground-based users and are not optimized to support drones operating in the sky. Current cellular infrastructure relies on antennas oriented toward the ground, creating significant coverage gaps for aerial vehicles, especially at higher altitudes. Satellites can provide the necessary communication links to support drone operations, including the delivery of assets and the collection of surveillance data. This is particularly useful for search and rescue missions, environmental and critical infrastructure monitoring, and military operations, where drones play a crucial role in gathering real-time data and delivering critical supplies.

- **Maritime coordination (either direct to UE or as backhaul of on vessels RAN)**

  Satellite broadband is also essential for marine surveillance and rescue operations, providing communication links that are not dependent on terrestrial infrastructure. This enables coordination between vessels, aircraft, and rescue teams during search and rescue missions at sea, where reliable communication is crucial for saving lives.

Direct satellite connection

- **Direct to cell (direct-2-device)**
  - This technology enables first responders and defense personnel to communicate directly via satellite using standard mobile phones, ensuring uninterrupted communication during emergencies in areas where terrestrial networks are compromised or unavailable. This capability supports effective coordination and rapid crisis response.
  - For citizens in remote or underserved regions, direct satellite connectivity to mobile phones ensures access to critical emergency services such as 911, 000, or 112. By bridging gaps in terrestrial network coverage, it enhances public safety and provides a vital link to emergency assistance.
  - Direct satellite communication extends a range of services over frequency range 1 (FR1), to standard mobile phones. This significantly expands the network capabilities in areas lacking traditional infrastructure or requiring high reliability.
  - The use of L- and S-bands (1.5-2.5 GHz) ensures robust satellite connections, even in challenging environments. Leveraging these frequencies, LEO satellites deliver voice and MBB services to users outside of terrestrial coverage.
- **NB-IoT NTN for messaging (using GEO and LEO)**
  - Narrowband Internet of Things (NB-IoT) over non-terrestrial networks (NTN) leverages simpler technologies and smaller satellite investments, including the reuse of existing geostationary satellites (GEO). This approach allows for a faster go-to-market (GTM) strategy, making it a cost-effective and efficient solution for deploying IoT services over satellite networks. At this point in time, however, the NB-IoT standards do not support voice, and NB-IoT is not generally available on smartphones.
  - Satellites can help to monitor a variety of environmental and infrastructure conditions. This includes detecting forest fires, monitoring tsunamis and human conditions, and assessing the status of critical infrastructure like power lines and pipelines. These capabilities are invaluable for early warning systems and proactive disaster management, enhancing the safety and resilience of communities.
- **Satellite broadband (airplanes, cars, UAVs and other devices)**
  - Currently, many satellite broadband devices operate on proprietary, non-standardized systems. Transitioning to a 3GPP-enabled ecosystem would enhance interoperability, scalability, and integration with terrestrial mobile networks. This shift aims to standardize fixed ground terminals, airplane and car connectivity, and UAV applications, ensuring seamless coverage for both commercial and government use across diverse environments.
  - High-gain antennas, operating in the Ku-band (10-14 GHz) and Ka-band (20-30 GHz) offer substantial bandwidths for high-capacity, secure links, improving signal focus, enhancing reliability across LEO, MEO, and GEO satellites and ensuring robust and efficient connectivity.

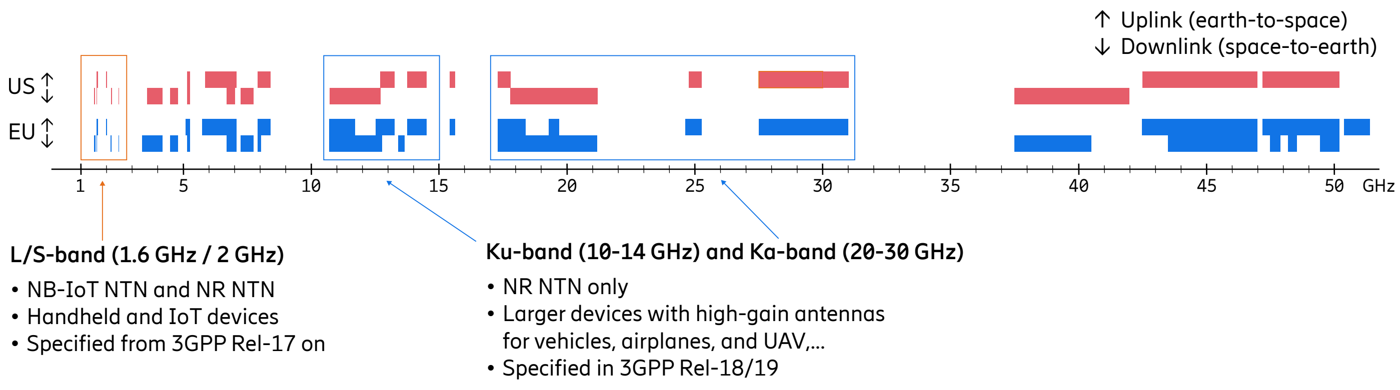

Figure 5: Spectrum allocations to satellite services in the EU and the US

Status of 3GPP for MC NTN-related aspects

The 3GPP continues to enhance NTNs with each release, focusing on capabilities that are vital for mission-critical use cases.

3GPP Release	Feature	Description	Benefit for mission-critical users
Release 17	Basic support for NTN in 5G NR, NB-IoT, and LTE-M	Necessary enhancements to handle the large Doppler shifts and propagation delays associated with satellite and other non-terrestrial platforms. Both LEO and GEO satellite orbits are supported, as well as HAPS.	Necessary enhancements are made to be able to connect to NTN. Integration of TN and NTN connectivity in the same device. Prerequisite for seamless service continuity.
	HARQ enhancements	Optimization increases the number of HARQ processes and adds the possibility to deactivate HARQ feedback completely, to avoid data rate stalling because of the long propagation delay.	Higher data rates are possible.
	Mobility enhancements	New trigger conditions for conditional handover (CHO) based on UE position and timing. Enhancements to cell reselection.	Better mobility robustness.
	Discontinuous coverage	Optimization for IoT NTN for sparse satellite constellations, to provide information to UEs about coverage gaps in time.	Users become aware of satellite coverage and can plan ahead.
	FR1 Frequency bands	Definition of operating bands in L-band (1.6 GHz) and S-band (2 GHz).	NTN supports handheld devices.
Release 18	UL Coverage enhancements	Improved coverage for certain bottleneck UL channels.	Higher data rates are possible / more ubiquitous service.
	Cell reselection enhancements	Providing information to UEs about areas with terrestrial coverage.	UE can switch back to TN when available, where better performance and capacity can be expected.
	RACH-less HO	Satellite switch without the need for the UE to perform Random Access.	Faster and more robust HO procedure during satellite switch.

	Unchanged PCI	Less control signaling during satellite switch, in particular eliminating the need to perform HO for all connected UEs.	The satellite switch becomes (almost) transparent to UEs.
	Network-verified UE location	Method for the NW to independently verify the reported UE location.	Requirement in some legislations for providing satellite service.
	FR2 Frequency bands	Definition of operating bands in Ka-band (20/30 GHz).	NTN supports more capable devices with larger antennas.
Release 19	DL Coverage enhancements	Repetitions for certain DL channels, as well as support for beam hopping techniques.	Accommodate satellite payload constraints such as limited power or feeder link BW.
	UL Capacity enhancements	Multiplexing users using orthogonal cover codes (OCC).	Optimize uplink capacity. Enhancing ISR use case capabilities.
	Regenerative architecture	Full gNB on board the satellite.	Better performance and flexibility, support for ISL.
	Mobility from LTE TN to NR NTN	Provide information about satellite neighbor cells in LTE TN cells.	Service continuity when moving out of LTE TN coverage.
	Store and forward	Satellites can serve UEs without being connected to a gateway at the same time.	Enabling operation of delay-tolerant, non-real-time services in areas visited by the satellites but without gateway infrastructure (such as mid-sea or remote areas).
	High-power UEs	New UE types with at least 26 dBm Tx power.	Better performance and higher data rates. Better protection against jamming and Electronic Warfare.
	Less than 5 MHz bandwidth	New channel configurations for smaller available bandwidths.	NTN can be deployed when less spectrum is available.
	New frequency bands	Definition of operating bands in Ku-band (12/14 GHz), and new bands in L-band and S-band.	More spectrum is available for NTN.
Release 20 (Future)	Voice calls over GEO	New low-rate codec and enhanced signalling.	Enabling voice calls over GEO and NB-IoT. Alternative to LEO where not available. Reduced cost
	Multi-orbit satellite access	Enhancements for satellite constellations with components in different orbits (e.g., LEO and GEO).	Enhancing capabilities in contested scenarios

Table 2: NTN capabilities across 3GPP releases

Conclusion

NTNs are set to play a crucial role in the future of MCN by providing reliable, resilient, and ubiquitous connectivity, seamlessly complementing traditional ground-based networks. They deliver uninterrupted communication in remote, hostile, or infrastructure-limited environments, enabling real-time situational awareness, enhanced operational efficiency, and robust disaster response. This makes them indispensable for defense, emergency services, maritime, and other critical sectors that rely on continuous and secure connectivity.

However, to fully harness its potential, further improvements are necessary for seamless integration with terrestrial networks, enhanced spectrum utilization, and ecosystem readiness.

5G has initiated the process of integrating NTN with TN, aiming to provide comprehensive coverage for users. As NTN evolves, it will be a vital component of 6G standards. While 5G standardization has laid a strong foundation, the deeper integration of TN and NTN, as well as continued advancements in antenna technology, power efficiency, and cybersecurity, will further strengthen NTN's role in delivering ultra-reliable, secure, and scalable communication solutions for mission-critical applications worldwide.

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Acronyms

3GPP – 3rd Generation partnership project

5GC – 5G Core

CHO – Conditional handover

CSP – Communication service provider

CT – Core network and terminals

DL – Downlink

FSS – Fixed satellite services

GEO – Geostationary orbit gNB – gNodeB

HAPS – High-altitude platform system

HARQ – Hybrid automatic repeat request

IoT – Internet of Things

LEO – Low earth orbit

LTE – Long-term evolution

LTE-M – LTE for machine-type communications

MBB – Mobile broadband

MCN – Mission-critical network

MEO – Medium-earth orbit

MNO – Mobile network operator

MSS – Mobile satellite services

N**B-IoT** – Narrowband IoT

NG – Interface between the gNB and the core network

NMS – Network management system

NR – New radio

NTN – Non-terrestrial network

ppm – Parts per million

QPP – Quality of service, priority, and preemption

RF – Radio frequency

RTT – Round-trip time

SA – Service andsystem aspects

SI – Study item

SNO – Satellite network operator

TN – Terrestrial network

UE – User equipment

Uu – Interface between the gNB and the UE

UL – Uplink

WI – Work item

Authors

Pedro Tercero Lozano
Global Business Development Director

Pedro Tercero currently serves as Mission-Critical Global Business Development Director at Ericsson, where he has held various positions since joining the company in 2007. With over 17 years of international experience in the telecommunications sector, Pedro brings a broad range of expertise in different technologies, acquired through diverse roles in both R&D and business areas. Pedro adeptly navigates complex environments and fosters innovation, which has led to several contributions to patent applications and academic publications. He holds an executive program in IT management from a top European business school, complementing his BSc in telecommunications engineering.

Kelly Krick
Global Business Development Director

Kelly Krick is the Director of Business Development for Mission-Critical Networks in North America. He partners with various teams to execute solutions for public safety, peacekeeping, utilities, and rail. Kelly has over 40 years of experience spanning wireline and wireless technologies, handling roles from design to operation. He has implemented many forms of telecom transformation – digital, wireless (2G through 5G), virtualized, and now cloudified. A senior member of IEEE, Kelly is a former Chairman of IEEE ComSoc's Communications Quality and Reliability Technical Committee and is currently a member of the Board of Advisors. His career began with Central Telephone Company in the US and subsequently included roles in Northern Telecom (Nortel) and Ericsson in the US, Japan, Singapore, and Sweden.

Sebastian Euler
Master Researcher, GFTL ER Radio S&S
Deployment & Spectrum

Sebastian Euler joined Ericsson in 2016. He is currently a master researcher at Ericsson Research, where he drives the standardization of NTNs in 3GPP. He is also a delegate to the ITU-R, engaging in the standardization of the satellite component of IMT (International Mobile Telecommunications). Euler has a background in particle physics and astronomy, and he holds a Ph.D. in physics from RWTH Aachen University, Germany.

Damanjit Singh
Project Manager, BNEW TS ST TB
ASP Arch SW & Platforms

Damanjit Singh joined Ericsson in 2008 and worked within the Ericsson testbed program focusing on prototypes and baseband. He currently serves as the project manager for the NTN proof of concept. Singh holds a B.Tech. in electronics and communication from Dr. B. R Ambedkar National Institute of Technology in Jalandhar, India.

Eduardo Medeiros
Senior Researcher, GFTL ER Networks
PNI Netw IFs & Indoor

Eduardo Medeiros joined Ericsson in 2011 and has worked with backhaul, fronthaul, and indoor radio technologies. He currently works as a senior researcher at Ericsson Research. Medeiros holds a Ph.D. in electrical engineering from Lund University, Sweden.

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